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ABSTRACT

The critical and creative thinking dispositions which are intrinsic to children's critical thought may reflect the standards of an adult culture which values verbalized thought over other kinds of human intelligence. Primary critical and creative thinking dispositions are those which help the child explore the world. These are biological processes that can be discerned as children discover the way things are as they play. Teachers can think of primary dispositions as functional components which underlie and impel children's need to discover. An inventory of such dispositions indicates that some, such as being open, resisting closure, tolerating frustration, taking risks, and controlling impulsivity, are associated with wonder. Other dispositions, including being imaginative, testing expectations, trying new things, practicing, are associated with exploration. In this paper, implications for classroom practice are discussed in terms of the ways in which teachers familiarize themselves with the primary dispositions as they are manifested in children, and ways of enhancing and assessing children's primary discovery dispositions. (RH)

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Facilitating Critical And Creative Thinking Dispositions In Children

Alma M. Swartz - Tetrault

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Description Of Proposed Paper:

Facilitating Critical And Creative Thinking Dispositions In Children

Submitted By Alma M. Swartz

May 1, 1987

While many in the field of critical and creative thinking acknowledge the importance of the need to teach for critical and creative thinking dispositions, the stress has been on the discrete critical and creative thinking skills. In a previous paper, I argue that teaching for critical and creative thinking attitudes and dispositions, such as openmindedness, or the tendency to seek reasons, is a necessary precondition to the acquisition and transfer of the discrete skills.

This paper explores the idea of primary critical and creative thinking dispositions which underly and impell critical and creative thought. These primary dispositions developmentally precede and are more global than the more specific, somewhat language dependent dispositions which have been previously described by this and other writers. As a basis for analyzing the role of dispositions toward critical and creative thinking processes in children this paper provides a general overview of biological aspects of cognitive development pointing out significant correlations with play activity as an expression of these dispositions.

The primary dispositions are categorized and explored as these interact with critical and creative thinking skills. A discussion of the ways in which cultural bias, as expressed in our schools, often runs counter to the child's natural inclination toward critical and creative thought, is provided with suggestions for the encouragement and facilitation of the dispositions as a means of ensuring the attainment of critical and creative thinking skills in the classroom. I thus set the stage for the inclusion of these developmental needs in primary education.

Introduction

As educators, we need to look seriously at the kind of thinking that puts forth notions such as, owning three cars is better than owning one; if plastic is useful, find a million uses for it and if one nuclear bomb is a deterrent, more bombs are better. Given the current state of the world, with pollution in the form of lukemia-causing chemicals and nuclear waste, we can no longer afford to educate our children as if quantity were the paramount commodity.

By the same token, we can no longer perpetuate the myth that the only value of intelligence is in its quantity. To do so not only places false restrictions on human intelligence, but sustains the kind of narrow-minded thinking which finds easy solutions, makes hasty judgments, fails to take into account the total situation, or to discover alternatives, and impedes the development of these kinds of qualities or dispositions which we find in good critical thinking.

What education has done well is help the child to label what is already known in experience: physical properties, numerical correlations, color, and so on. We then teach the child to build on these verbal concepts until even neutrons and protons, which aren't already known in experience, are understood. The child who correctly understands these, proves it on tests. How wonderful, we think, that today's child knows about atoms, or the double helix structure of DNA, whereas our parents or grandparents at the same age were wondering about gravity and germs.

Yes, this is wonderful. But what will they do with this knowledge? Will they repeat the mistakes of those who were not able to predict the pollution they've caused? The 1983 National Commission on Excellence

suggests that what education has not done well is teach thinking. I believe we've done worse--we've actually inhibited critical thinking in children. It isn't simply a case of having taken the easy road, teaching immutable facts being easier to test, for example. We also haven't provided teachers, administrators, and parents with a good and true understanding of the total child or the basics of human intelligence.

Indeed, we need to teach for critical thinking--but in ways that encourage critical and creative thinking in children, in all of its totality through careful and loving attention to the ways in which children naturally do this. This means we must provide, as good educators, not only a variety of experiences and enough time to explore, but also to become well grounded ourselves in an understanding of both critical thinking skills and critical thinking dispositions.

One of the most important responses in recent years to the growing realization that ineffective thinking causes problems which threaten us all, has been the critical thinking movement in education. New curriculum materials offer a number of exercises in critical thinking skills, such as, identifying assumptions in statements, discriminating cause and effect, or using evidence. The response has been thoughtful and provocative, and teachers have been pleased to try these techniques. Much less frequently, though, have teachers in this movement attended to the more elusive, "affective" aspects of critical thinking--dispositions such as resisting jumping to conclusions, or suspending judgment. It is as important for children to develop the disposition to naturally look for alternatives, or to suspend judgment when gathering information in order to make accurate predictions, as it is for the child to simply learn, in the context of subject matter, to make good predictions.

Although some theorists in critical thinking acknowledge the

importance of teaching for critical and creative thinking dispositions, the major emphasis has been on the discrete thinking skills, partially in response to the structure of most public schools, but also because the dispositions seem like personality constructs and it is unclear how to teach these and whether they can or should be taught. Yet, it is clear that teaching for thinking dispositions--openmindedness, or the tendency to seek reasons--is essential not only to the acquisition, but to the transfer of critical thinking beyond classroom situations.

The Transfer Question

The transfer question is a problem which has plagued those who advocate teaching critical thinking skills in the classroom, an understanding of which will be important to this discussion. Questions which arise out of the concern that children do not carry over critical thinking learned in school to everyday decision-making encompass the following: Have critical thinking skills, indeed, been taught in our schools? If so, why do they not seem to transfer to everyday reasoning? If we teach critical thinking skills in one subject, are these the same as critical thinking in other areas? Can we ensure the generalization of critical thinking taught, for example, in science to other areas and to everyday reasoning? Must we teach for transfer? How?

A variety of things have been written about the transfer question. John McPeck, (2) on one side of the issue, insists that critical thinking skills are necessarily linked to specific fields or disciplines and argues that different logics are utilized, depending upon the thing about which we are thinking critically. Accordingly, to think critically in the field of mathematics does not imply that the critical thinking skill utilized in

this field will transfer to another field or to everyday reasoning. David Perkins (3) argues that thinking skills are transferable but finds that they do not tend to transfer easily. He proposes two kinds of transfer: high road requires a more conscious effort while low road transfer occurs with more automaticity. He suggests practicing in many areas to expand the possibilities for the application of thinking skills (low road transfer) and instructing students in the more deliberate acquisition of the general principles which underlie the critical thinking skills (high road transfer).

Robert Swartz (4) suggests "working a thinking-skill focus into the mainstream of the curriculum in order to develop critical thinking approaches and procedures that students will transfer," stressing the need to apply these same procedures across the curriculum (his infusion approach) so that when students encounter an everyday problem in some other area of study, they have these within their repertoire of thinking skills. Robert Ennis, (5) at the other end of the continuum, is convinced that critical thinking does transfer from one domain to another, suggesting that "there are general principals that bridge subjects, that have application in many subjects." He points out that he was perfectly capable of using critical thinking when he served on a jury even though he had never had courses in critical thinking in this context.

Suggested techniques which these theorists provide, such as modeling by the teacher, bridging from one situation to another ("here again we need to look at causes") and bringing to consciousness the methods children have used to solve problems (metacognition), undoubtedly help to advance the <u>acquisition</u> of critical and creative thinking skills in the classroom. But these, alone, are likely to fall short of their intended goal--the transfer of these important skills to situations requiring

critical thought outside of the classroom--unless we attend to the careful development of critical and creative thinking dispositions.

This can be seen clearly by looking at specific examples. Some teachers, in teaching thinking skills, help the children to become proficient in discovering reasons for particular outcomes in stories, or for certain historical happenings, or teachers might develop their own paragraphs and statements so that children can underline the reasons in these. In the context of the lesson, with the structure and guidance provided by the teacher, children can do this--even become proficient at discovering reasons. However, our goal in education is to teach children how to use these proficiencies beyond the classroom--to transfer this understanding to everyday reasoning. How useful is the learned skill of uncovering a person's reasons if the child doesn't develop within her/himself the tendency to look for reasons?

More importantly, when we consider the potentially disastrous outcome of not teaching for transfer, it becomes our moral duty to do so. We need to take into account the total situation, to teach children to think better than those who failed to take into account that plastic can also kill the environment. If children haven't, within themselves, developed the tendency to take into account the total situation when solving problems what can the future be like?

It is essential, then, for teachers to recognize that dispositions access and prompt the utilization of the skills and that, if these are not attended to, transfer to other life situations, such as the ethical use of atomic energy and recombinant DNA, is likely to be frustrated. The understanding of the impact of dispositions on thought is not new. Dewey, in How We Think, mentions attitudes of open-mindedness, whole-heartedness and responsibility which help one to acquire other points of view, to

enthusiastically inquire and to have the capacity to carry through, or finalize. (6) The following is a list, more refined than Dewey's more general overview, of commonly accepted dispositions essential to our understanding of a good thinker: (7)

1. Listen to another person's point of view or ideas
2. Suspend judgment or resist jumping to a conclusions
3. Reason from a perspective other than one's own
4. Remain generally objective/openminded
5. Take a position, given sufficient evidence/reasons
6. Look for alternatives
7. Seek a clear understanding of the question/problem
8. Ask clarifying questions
9. Look for reasons/information
10. Make good use of resources
11. Make use of credible sources
12. Remain relevant to the point/topic
13. Take into account the total situation
14. Change a position, given evidence/reasons
15. Persist, seek precision
16. Accept criticism, incorporate ideas of others
17. Self-evaluate one's own ideas
18. Fit parts of a problem together in an orderly way
19. Resist closure ("play" with ideas")
20. Take risks, even if one's idea may seem "silly"
21. Put together disparate ideas
22. Discover relationships, patterns
23. Build on someone else's ideas
24. Give good feedback to others
25. Remain sensitive to the feelings, knowledge, expertise of others

Teaching students to understand causal reasoning, then, without attending to the kinds of thinking dispositions which are inseparable from the use of this thinking skill is likely to be an exercise in futility.

Some Problems

Though the above list is useful in the ways just mentioned, it is problematic when we wish to fully capture the notion of critical and creative thinking dispositions as intrinsic to critical thought. While it is certainly true that our schools need to pay much more attention to the dispositions listed above, if we in the newly evolving field of critical thinking can allow some self-criticism, we may see that one of the biases which finds its way into education has found its way into this list. That is, many of the dispositions on this list reflect the standards of an adult culture which values verbal thought at the expense of other kinds of human intelligence. (8) Moreover, because of this bias, many of the dispositions listed are not helpful in thinking about how younger children, who haven't fully acquired language and communication skills, exercise critical and creative thinking.

What two year old is able to listen to another person's point of view? Should we expect a two year old to suspend judgment or resist jumping to conclusions, or is the tendency to be impulsive one mechanism through which the two year old gains essential experience? If we believe that critical and creative thought is endemic even to small children, we must look beyond the emphasis on verbal facility stressed in our culture and attempt to discover how the thinking dispositions, essential to good critical thought, unfold in early childhood. If we impose adult cultural standards on our research about young children, we will certainly miss the

mark in our attempts to plan for them educationally.

It will be important, then, to begin to clarify from a developmental perspective how thinking dispositions emerge and unfold in the developing child, gaining a more accurate insight into the actual nature of these with less chance of contamination due to cultural, theoretical, or other biases. It seems to me that small children, including infants and toddlers, who are less language oriented, manifest more basic dispositions than those on this list. If we consider how these are revealed in the child's play activity, we will gain insight into these early tendencies.

Overview Of Learning And Play In Early Childhood

It may be helpful to begin with a general overview of cognitive development as it interacts with other aspects of development. We want to keep in mind that thinking, especially critical thinking, is a higher level cortical function which is natural to humans and, as such, is a unique species specific trait. This capacity to critically assess the world and ourselves in it is strongly motivated, then, by a biological imperative. Evidence for this imperative may be seen in early childhood in strong underlying tendencies which impel the child toward discovery.

These rudimentary tendencies are intrinsic to the child's developing critical and creative thinking. I refer to these as primary critical and creative thinking dispositions--which cannot be separated from the actual processes of critical and creative thinking. These prelinguistic dispositions fall into two categories of discovery-oriented primary dispositions. There are those which help the child to seek, to search, and to question, in short, to wonder about the world--and those which help the child to integrate, to incorporate, and to decide about the world.

We need to recall that these are biological processes. Research into human neurological functioning has discovered that specific instances of thinking are simultaneously represented in various cortical functions of the brain as thinking occurs. While there are certain temperamental and environmental blocks which can intrude into cognitive development, given adequate intelligence, the availability of interactive experience, caring, and safe encouragement the child develops these cognitive functions. As the child cognitively organizes in interaction with the environment experiences are "matched" with those in memory and integrated. (9)

After discovering that there's something "out there," perhaps after hours of deliberate staring at a blank wall, the new born actively seeks to discover more. We may see in this initial interaction (the simultaneous taking in or incorporating of the environment--blank wall--and the infant's own motivation or intent as it stares with what we must call interest) the emergence of a curiosity which is both satisfied by and fed by further discovery. This curiosity impels the infant who conquers all (partially developed muscle coordination, an unfamiliar environment) in a struggle, for example, to get close enough to grasp an object. Long before language is fully developed, the child's ideas are expressed in many early interactions. Actions, then, on the part of young infants are deliberate--that is, motivated by some form of rudimentary conscious thought. (10)

If we accept the definition of critical thinking offered by Robert Ennis, "reasonable, reflective thinking that is focused on deciding what to believe or do," (11) then we must acknowledge that even very young children are able to do this; not that they are always accurate, but, given their limited experience and understanding, they are quite well able to evaluate the world they encounter. The child, for example, who has

successfully climbed a few stairs may reasonably decide that it would not be very difficult to master the whole set of stairs (isn't this evidence of the child's ability to predict?). Rudimentary inferential skills may be seen in the child's ability to formulate the rules of language. This is most obvious in errors of generalization (exceptions to the past tense rule, for example, saying, "goed" for "went").

These rudimentary critical and creative thinking processes which we are able to observe in very young children are not very different from those which we utilize as adults. This becomes more clear as we delineate the underlying primary dispositions which seem to emerge quite succinctly in the child's natural playful interactions. Professionals interested in discovering how children develop their thinking capacities often remark at the enormous amount of energy and interest that children expend in play as they go about learning of the world and themselves in it. The child's fascination with play activity frequently becomes an all-consuming interest which momentarily shuts out the rest of the world. This play activity is a microcosm of the biologically impelled need to discover.

While it has been mistakenly assumed in the past that play is simply the child's pleasure, we now know that playful interactions are a means whereby the child learns and entails much more cognitive activity than previously suspected. As language develops and the child recognizes this as a remarkable means of gathering information to understand more about the world, the questions begin to fly. We may see in these questions the same kind of active engagement in concept formation which the younger non-verbal child expresses in the physical manipulation of objects or the control of the body in its environment.

Exploring through playful interactions provides an ever increasing understanding of the nature of the world and the self in it. The child

builds on these experiences to become skilled and knowledgeable--play activity containing all the fundamentals of human interactions. It is now a commonly accepted notion that play depends on and utilizes many cognitive skills--seeing, listening, controlling one's body, deciding, independence, dependence, restraint, learning and following rules, memory, negotiating, reasoning, judging, understanding one's own strengths and weaknesses, understanding others, discovering relationships, setting goals, planning, cooperation, organization, creativity, hypothesis generation, coordinating, inventiveness, concentration. Play encompasses all this and more, yet children can't seem to get enough of it. Play always reflects and furthers development. The child's physical, social cognitive, and emotional development are all enhanced through play.

We quite easily see how the child's physical development is aided through exploratory activities (such as climbing, walking, pushing and lifting things) because we are readily able to observe this aspect of development. Physical activities also enhance cognitive development. Playing with heavy pots and pans, then with water gives the child two very different kinds of feedback about muscle control and the nature of things in the world. Playing with sand adds a third dimension, the child coming to a cognitive understanding, not only of the discriminations of weight, shape, space, and utility of these things, but also a cognitive awareness of his/her own physical capacities in regard to these. Primary discovery dispositions are part and parcel of this process.

The child who has played with a ball, been wheeled in a carriage, or swung on a swing brings a certain cognitive awareness, through these experiences, to the initial attempts at bike riding. The child gains a cognitive understanding of the nature of physics and gravity (without knowing the words) simply by dropping toys out of the crib, or negotiating

a set of stairs--a knowing takes place. The child who must learn how to follow the written words from left to right on a page must first have a cognitive awareness of the left and right sides of his body in space.

We may also see that the child's emotional development is enhanced through a discovery of one's own competencies which lead to achievement in the successful manipulation and understanding of sand, water, pots and pans. The good feeling which accompanies mastery in one area motivates the child toward mastery in other areas, the feeling of accomplishment in these achievements being an integral component of the whole process. We may see in this motivation the disposition to seek after new experiences.

This motivation to discover more may be seen in the child's selection of very difficult undertakings, such as walking and balancing along a curb, then higher up on a fence (or the baby's interest in a tiny speck of lint leading to the tendency to carefully inspect more complicated objects) all as a means of discovering what else in the world the self is capable of mastering. The child's emotional development is also enhanced when the child can symbolically recreate a rewarding experience in an attempt to recapture that good feeling, or reproduce a disappointing one, making it more tolerable and planning for a different outcome next time.

While developing motorically, cognitively and emotionally, the child's social understanding is also enhanced through cooperative play, for example, when cooperating with another in a game of catch. As children follow the rules of the game, or exercise self discipline while waiting to take turns, they are taking learning about the essentials of social cooperation. The child who is able to participate in competitive play learns something about skill-building and risk-taking through the safety of the game which prepares the child for the adult competitive world.

It may be clear that the child learns new things in the same old way,

seeking after experience and incorporating these through an expanding process of not totally conscious discovery, as the total child develops. While the focus may vary, the impetus to discover, remains the same.

Primary Dispositions As Impetus To Discovery

Discovering begins in infancy as the developing sensory mechanisms awaken the need to see, hear, taste and touch more. For our purposes, it will be helpful to think about the underlying dispositions as functional components which impel the need to discover. The child selects modes of discovering based on prior experience. We can influence this only to the degree of our awareness of the child's needs, motivation, readiness and experience. For example, I once tried in vain to get a 9 month old child to put plastic shapes into a container through their corresponding holes by matching them up so that all she needed to do was give them a slight tap (after all, wasn't this the way the toy was intended to be used?), but it was her idea to put her mouth over the openings making sounds which echoed inside the container. She ignored my attempts, dumped out the shapes and delighted herself making what she obviously felt were wonderful sounds. Once I caught on, however, she quite eagerly accepted other containers which I found, spontaneously discovering the kinds of sounds she could make in each after I echoed into one of them.

The child utilizes and develops critical and creative thinking dispositions in accordance with basic temperament, past experience and environmental availability. The child whose basic temperament is more cautious, whose wary attempts at exploring the environment are more passive, nonetheless decides, within the safety of certain parameters, which aspects of the world are worth pursuing, perhaps discovering these

in more depth and detail than the highly active child (who might, by the way, benefit from exposure to this careful child's approach to world experiences). It may also happen that the cautious child does not fully develop the tendency to take cognitive risks--remaining on the periphery of ideas, surveying, perhaps taking in information without forming a judgment, or giving meaning to ideas, or readily combining information to form concepts. This child, by the same token, may benefit from exposure to the child who is freer to take risks.

The child whose parents encourage explorations, providing a variety of safe experiences for the child's developing needs, will develop not only physically, socially and emotionally, but cognitively as well. It is this child we should have in mind when considering ways of implementing the natural development of primary dispositions in the classroom, rather than the child who experiences unnatural or unhealthy intrusions into the process, the evaluation and remediation of which are the responsibility of professionals other than the teacher.

The most important of these primary dispositions which motivate discovery (critically, creatively understanding self/other than self) are listed below:

Primary Discovery Dispositions

Search-Seek-Question	Integrate-Incorporate-Decide
Being Open	Tendency For Ordering
Exploring	Tendency To Associate, Conjoin
Wondering	Tendency To Appraise, Assess
Persisting	Being Imaginative
Resisting Closure	Testing Expectations
Generating Expectations	Seeking a Focus, Orientation
Tolerating Frustration	Being Precise
Tolerating Ambiguity	Using Experience
Seeking Experience	Trying New Things
Seeking Understanding	Tendency To Imitate, Model
Taking Risks	Being Inventive
Controlling Impulsivity	Engaging In Practice
Maintaining Curiosity	

At first glance some of these dispositions may seem to overlap, for example, wondering being a part of the need to explore. Yet, on closer inspection, we see wondering as more passive and exploring as more active seeking or searching dispositions. The tendencies for ordering and to associate are also closely related, but ordering is a more specific putting together, whereas one can associate quite disparate ideas, or experiences--and associating disparate ideas can be inventing, but forming the associations is the notion here, not the actual inventiveness.

Teaching For The Dispositions

Teachers will be concerned about implications for classroom practice. There are two ways that we can approach this. One offers suggestions to teachers to familiarize themselves with the dispositions as they are manifested in children. Since the most important first step in educating children is educating ourselves, this process will be important in understanding and facilitating dispositions in early education. The other approach offers more specific examples for enhancing the dispositions and for assessing these. Both make use of the inventory below.

The inventory can be used in the classroom as a general evaluation instrument to discover which dispositions predominate in children, and it can be a tool for teachers to use as a means of becoming familiar with these dispositions. It can be filled out by others on the teaching team, those in physical education, art, music, the occupational therapist, and parents may offer their insight. Through the use of the inventory teachers can assess the degree to which their students manifest these important dispositions, as well as evaluate their own teaching strategies once they engage in activities to promote the development of these dispositions. This process sensitizes teachers to the dispositions, providing "practice" to internalize and understand the dispositions.

Knowing each child should be the essential goal for the teacher in September. Taking the whole month, with dispositions in mind, to fully understand each child is not unreasonable and will provide the teacher with the necessary insights to make provisions which will promote these. Maintaining an open, questioning attitude ourselves will be important (What does this tell me about his/her needs? Which dispositions does this

child use well? What blocks are there and what good experiences provide for the removal of these?). We can involve the school counselor or school psychologist in brainstorming sessions to plan for the needs of individual children or the whole class. Critical and creative thinking and the dispositions can be an agreed-upon focus in the school.

For individual children, more specifically, in looking at particular inventory scores we will want to discover if certain patterns emerge. Does a child, for example, explore nicely but rarely attempt to be precise? Does this same child have difficulty contolling impusivity? The inventory can be used in this way to discover the kinds of blocks which prevent the child from experiencing how being precise can be rewarding. With this knowledge, problem solving situations can be designed to encourage impulse control (besides "red light, green light" stop and go exercises which don't necessarily integrate thinking skills) and provide the experience of being successful through precision. Perhaps working with a partner (who is able to be precise) on some cooperative learning project which requires taking turns will be helpful for this child.

In thinking about a child who is not always open to experience, would this child have difficulty with risk taking and tolerating ambiguity? Would not the tendency for ordering, tendency to seek a focus, or orientation be greater? What does this mean? Is this simply the child's style? We need to know how closed the child might be and to what degree the need for order may even be obsessional. We can still think of ways to open the child to exploration, by providing materials with ambiguous outcomes, with no set solution, and observe the child's approach to find out if, indeed, this is stress provoking or if the child simply prefers to seek order.

Encouraging children in the exercise of the dispositions is as important as encouraging other kinds of learning. Remarking, when Mary has been precise, "How carefully you did that Mary" will not only reinforce her behavior, but may make other children aware of this tendency and encourage them. When an impulsive child is making attempts at control, acknowledging this will help to make the task worthwhile: "It's hard to wait for your turn but when you two are finished it will look great, don't you think?" We must guard against turning the list of dispositions into a series of teacher-directed questions, such as, "Are you using your curiosity?" or,"Are you being patient?" thinking that we are teaching dispositions. Teachers need to reduce the number of verbal questions they ask and encourage questioning in children, through the provision of significant interactive experiences which encourage exploration and provoke questioning.

Good teachers intuitively do this. We need to bring these intuitive practices to consciousness and share them with one another, relative to teaching for thinking dispositions. Many schools are beginning to adopt peer coaching as a means of introducing, defining, and sharpening teaching strategies for the integration of critical and creative thinking in the classroom. Teachers are finding this to be quite helpful because the team shares the burden rather then the isolate teacher. In introducing critical and creative thinking dispositions into the curriculum, this kind of support will be beneficial.

Given the importance of the underlying critical and creative thinking dispositions, primary education for children ought to encourage curiosity to discover the necessary facts in any endeavor, rather than teaching facts which will be forgotten if not embedded in significant experience.

Through materials and activities which allow for as many uses and ideas which the child can creatively imagine, the critical and creative thinking skills should be taught. This experiential approach will be the most reasonable way to also facilite the dispositions so that future events and ideas can be fully, carefully explored without being tied necessarily to the original concrete uses and so that misuses of facts can be anticipated and avoided in future generations.

In summary, teaching critical thinking skills is important, but integrating the dispositions is essential to the transfer of these skills. Since these are important to education, the early grades should be the focus of primary dispositions which developmentally precede the dispositions thought to be worth developing in older children and adults. These more global dispositions are obvious in the young child's playful interactions and are seen as biological motivators for seeking, searching, questioning and for integrating, incorporating and deciding as the child uses these in rudimentary ways which helps to reasonably, reflectively decide what to believe or do.

INVENTORY OF PRIMARY DISCOVERY DISPOSITIONS

This inventory is intended for use as a general guide to discovering which critical and creative thinking dispositions may be present in children in the primary grades. It will not be useful in defining whether these are not present. The absence of evidence for a disposition does not mean it isn't available to the child--it may simply not manifest itself clearly at this time.

SCALE: 1. NEVER 2. SOMETIMES 3. FREQUENTLY 4. ALWAYS

HOW OFTEN DOES THE CHILD MANIFEST THESE PRIMARY DISCOVERY DISPOSITIONS?

SEEKING-SEARCHING-QUESTIONING

1. Being Open	1	2	3	4
2. Exploring	1	2	3	4
3. Wondering	1	2	3	4
4. Persisting	1	2	3	4
5. Resisting Closure	1	2	3	4
6. Generating Expectations	1	2	3	4
7. Tolerating Frustration	1	2	3	4
8. Tolerating Ambiguity	1	2	3	4
9. Seeking Experience	1	2	3	4
10. Seeking Understanding	1	2	3	4
11. Taking Risks	1	2	3	4
12. Controlling Impulsivity	1	2	3	4
13. Maintaining Curiosity	1	2	3	4

INTEGRATING-INCORPORATING-DECIDING

14. Tendency For Ordering	1	2	3	4
14. Tendency To Associate, Conjoin	1	2	3	4
15. Tendency To Appraise, Assess	1	2	3	4
16. Being Imaginative	1	2	3	4
17. Testing Expectations	1	2	3	4
18. Seeking A Focus, Orientation	1	2	3	4
19. Being Precise	1	2	3	4
20. Trying New Things	1	2	3	4
21. Tendency To Imitate, Model	1	2	3	4
22. Using Experience	1	2	3	4
23. Being Inventive	1	2	3	4
24. Engaging In Practice	1	2	3	4

c 1988 Alma M. Swartz

Footnotes

1. Summarization taken from, Swartz, Alma M. (1987) "Critical Thinking Attitudes And The Transfer Question" in Thinking Skills Instruction: Concepts and Techniques, eds. Marcia Heiman and Joshua Slomianko; Washington, D.C.: National Education Association

2. See McPeck, John E. (1981) Critical Thinking and Education; New York: St. Martin's Press

3. For a more in-depth understanding of these important methods see, Perkins, D.N. (1987) Transfer And Teaching Thinking" in Thinking: The Second International Conference, eds. Perkins, D.N., Lockhead, Jack and Bisphop, John; Hillsdale, New Jersey: Lawrence Erlbaum Associates

4. For more on his "infusion approach" see, Swartz, Robert J. (1987) "Critical Thinking, the Curriculum, and the Problem of Transfer" in Perkins, lockhead, and Bishop, Op. Cit.

5. This and more on critical thinking skills may be found in Ennis, Robert H. (1987) "Critical Thinking and the Curriculum" in Heiman and Slomianko, Op. Cit.

6. Dewey, John (1933) How We Think; Boston: D.C. Heath And Company

7. Dispositions characteristic of creative thinking were added to an original list of 14 dispositions in Ennis, Robert H. (October, 1986) "Goals For A Critical-Thinking/Reasoning Curriculum"; Educational Leadership. The expanded list was used to develop a testing inventory (in the appendix) to evaluate critical and creative thinking dispositions in older students. It is also in Heiman and Slomianko, Op. Cit. I would appreciate any feedback regarding its usefulness. Some find its best use as a tool for teachers and students to gain insight into dispositions which had been more preconscious, that is, as a metacognitive device.

8. Gardner defines seven different intelligences, noting that the child "finds it easy--and perhaps appealing--to effect connections among disparate realms: to note similarities among different forms within or across sensory modalities and to capture these in words (or other symbols); to make unusual combinations of words, or colors or dance movements, and to gain pleasure in doing so." (p.291) Gardner, Howard (1985) Frames Of Mind: The Theory of Multiple Intelligences; New York: Basic Books, Inc.

10. Vygotsky discovers a prelinguistic phase to verbal thought. (p. 41) Vygotsky, Lev Sememovich (1962) Thought And Language; Cambridge, Ma: The M.I.T. Press Piaget describes biologically invariant processes which amount to deliberate cognitive practices in the sensorimotor activities of early childhood. Piaget, Jean (1963) The Origins of Intelligence In Children; New York: The Norton Library W.W. Norton & Company, Inc.

11. The following explains Ennis' widely accepted definition: "Critical thinking...is a practical reflective activity that has reasonable belief or action as its goal...five key ideas here: practical, reflective, reasonable, belief, and action...combine into the...definition." (p. 10) "A Taxonomy Of Critical Thinking Dispositions And Abilities" in Baron, Joan Boycoff and Sternberg, Robert J. Eds. Teaching Thinking Skills: Theory and Practice; New York: W.H. Freeman and Company